Regression :-

Heights of father and son is given in cm.

x (ht of father)	150	152	158	157	160	161	164	166
y (ht of son)	154	156	158	159	160	162	161	164

Find 2 Reg line or. calculated expected average height of the son when the height of father is 154 cm.

Ans:-

x on y

$$(x-\bar{x}) = b_{xy}(y-\bar{y})$$

$$b_{xy} = r\frac{\sigma_x}{\sigma_y}$$

y on x

$$(y-\bar{y}) = b_{yx}(x-\bar{x})$$

$$b_{yx} = r\frac{\sigma_y}{\sigma_x}$$

$\bar{y} = 159.25$

$\sigma_y = 3.0311$

$\boxed{\gamma = 0.9669}$

$b_{xy} = \gamma \frac{\sigma_x}{\sigma_y} = (0.9669)\frac{(5.2782)}{(3.0311)}$

$\boxed{b_{xy} = 1.6837}$

$b_{yx} = \gamma \frac{\sigma_y}{\sigma_x} = (0.9669)\frac{(3.0311)}{(5.2782)}$

$\boxed{b_{yx} = 0.5553}$

X on Y

$(x - \bar{x}) = b_{xy}(y - \bar{y})$

$(x - 158.125) = 1.6837(y - 159.25)$

$\sigma_x = 5.2782$

y on x

$$(y-\bar{y}) = b_{yx}(x-\bar{x})$$

$$(y-159.250) = 0.5553\,(x-158.125).$$

Expected average height of the son when the height of father is 154 cm.

$$(y-\bar{y}) = b_{yx}(x-\bar{x})$$

$$(y-159.2500) = 0.5553\,(x-158.1250)$$

$$y = 0.5553x - 86.9687 + 159.2500$$

$$y = 0.5553x + 72.2813$$

$$y = 0.5553\,(154) + 72.2813$$

$$\boxed{y = 156.9813}$$

Average height of the son is 156.98 cm when the father height is 154 cm.

Correlation :-

Note :

Let x on y

$ax + by = c$

$ax = c - by$

$x = \frac{c}{a} - \frac{b}{a}y$

$bxy = -\frac{b}{a}$

Let y on x.

$ax + by = c$

$by = c - ax$

$y = \frac{c}{b} - \frac{a}{b}x$

$byx = -a/b$

* Find $byx \cdot bxy$ it is greater than 1 our assumption is wrong, reverse & proceed

(5) In a correlation analysis the equation are $3x+12y=19$, $3y+9x=46$. Find correlation co-effecient & mean value of x & y.

Soln:-

x on y

$3x+12y=19$

$19-2y=3x$

$x=\frac{-12y}{3}+\frac{19}{3}$

$b_{xy}=-4$

y on x

$3y+9x=46$

$3y=46-9x$

$y=\frac{46}{3}-\frac{9x}{3}$

$b_{yx}=-3$

$b_{xy}\cdot b_{yx}=(-4)(-3)$

$=12>1$

$\therefore$ Assumption is wrong

Let x on y

$3y + 9x = 46$

$9x = 46 - 3y$

$x = \frac{46}{9} - \frac{3}{9}y$

$b_{xy} = -3/9$

Let y on x

$3x + 12y = 19$

$12y = 19 - 3x$

$y = \frac{19}{12} - \frac{3}{12}x$

$b_{yx} = -3/12$

$b_{xy}\, b_{yx} = (-3/9)(-3/12) = (-1/3)(-1/4)$

$= 1/12$

$b_{xy}\, b_{yx} = 0.083$

$r = \pm\sqrt{0.083}$

$r = -0.288$

To find mean :-

$$3\bar{x} + 12\bar{y} = 19$$

$$3\bar{y} + 9\bar{x} = 46$$

$$\bar{x} = 5$$

$$\bar{y} = 0.33$$